UNITED STATES DEPARTMENT OF AGRICULTURE
OFFICE OF COOPERATIVE EXTENSION WORK
THE BUREAU OF PLANT INDUSTRY COOPERATING

VOLUME 4 MAY, 1926 NUMBER 2

The Extension Pathologist

"TO PROMOTE ECONOMIC CROP PRODUCTION,
IMPROVE THE QUALITY OF THE PRODUCTS, AND
REDUCE WASTAGE IN STORAGE, TRANSIT, AND AT THE MARKET"

THE EXTENSION PATHOLOGIST

Vol. 4 Number 2

Contents of this issue

page

SMUT CONTROL NUMBER

Field and market studies have shown that in many wheat sections stinking smut has been on the increase during the past 5 years. Fortunately research has given us the copper carbonate treatment with which to combat the disease. This method has been tested and approved in practically all the wheat growing States and in several, through efforts of experiment station and extension workers, has become well established as a farm practice. It is hoped that the articles appearing in this number will serve to stimulate thought on the project and, at the same time, make clear some of the ways in which the Department of Agriculture can assist in furthering control work in the States.

- - - - - - - - - - -

SMUTTY WHEAT IN COMMERCE

By E. G. Boerner, Grain Investigations,
U. S. Department of Agriculture

Over 128,000 cars of wheat grown in the United States and arriving at the terminal markets during the past three years up to April 1, 1926 were graded as "smutty" under the federal grain standards for wheat. Smutty wheat cannot be ground into flour until the smut has been removed by the use of special machinery, and this treatment costs money for the special machinery required, for operating the machinery, loss of weight in the grain, and extra handling of the wheat. The cost of removing the smut from any particular lot of smutty wheat depends somewhat on the degree of smut present and the facilities available. Smutty wheat will, therefore, practically always sell at a discount over what the same wheat would bring if it were not smutty. The market discounts for smutty wheat usually range from a few cents to 20 cents or over per bushel. The total discounts for all smutty wheat grown and marketed in the United States during the past few years has amounted to several million dollars each year. Nine and four-tenths per cent of the 353,340 cars of wheat arriving at the various terminal markets from July 1, 1925 to March 31, 1926 were graded "smutty" by licensed grain inspectors. Many of the important markets, however, showed a much higher percentage of smutty wheat. As an illustration of this the inspections at Omaha show 42.1 per cent smutty, Portland, Oregon, 29.6 per cent, Kansas City, 12.4 per cent, and Duluth 17.4 per cent. These figures are for all wheat of all classes received at these markets. The detailed statistics bring out the fact that some classes of wheat show a much higher percentage of "smutty" than other classes and these percentages for some classes in some cases are very high.

The elimination or material reduction of the smut in the wheat sent to market from the farms through proper seed treatment to prevent the smut developing in the growing wheat would increase the profits from growing wheat very materially.

- - - - - - - - - - - - - - - - - - - -

PRESENT STATUS OF THE COPPER CARBONATE SEED TREATMENT

By W. H. Tisdale, Pathologist,
Bureau of Plant Industry

During the brief period of 6 years in which copper carbonate has been used in this country for treating seed, it has become the most popular fungicide for the control of bunt or stinking smut of wheat. Several million acres of wheat are now being grown annually from treated seed. It also is effective in the control of covered kernel smut of sorghum. Copper carbonate has not proved satisfactory for the control of smuts of oats. It prevents smuts of hull-less oats, but is less effective on hulled varieties. It is not at all satisfactory for the control of barley smuts.

As is commonly known, each of these smuts is caused by a minute vegetable parasite or fungus which is spread with the seed. The smut balls or masses which are so familiar are filled with very small spores or seed of the fungus, which may adhere to the surface of the grain or be carried between the glumes or hulls and the seed. As the grain germinates these spores germinate and form small germ tubes or threads which infect the seedlings, grow up through the tender tissues of the plant, and cause it to produce smutty instead of sound heads. Some of these smuts are more easily controlled by the copper carbonate treatment than others due, no doubt, to the nature of the grain. In the case of bunt of wheat the carbonate dust comes in direct contact with the smut spores which adhere to the surface of the naked seed, and is effective in killing them. The treatment is not as effective in the Pacific northwest where soil infestation occurs as it is east of the Rocky Mountains where infection depends entirely on seed-borne spores. On oats which have loosely fitting glumes or hulls the treatment is effective to a certain extent, but less satisfactory than it is on wheat. The lack of effectiveness on barley is very likely due to the tight fitting hulls which enclose the spores with the seed and protect them from the action of the slowly dissolving copper carbonate until infection takes place.

Types of copper carbonate. There has been considerable interest shown concerning the best type of copper carbonate for seed treatment. There no doubt has been considerable material of poor grade used due to the greatly increasing demands on manufacturers who have been producing the best product they can with the available knowledge concerning what is needed. The situation has greatly improved. It is not difficult to obtain satisfactory copper carbonate manufactured especially for seed treatment. There are some complaints of shortage, but this condition can in most cases be met by a little forethought in placing advanced orders.

There are, generally speaking, two types of copper carbonate obtainable. One type contains about 52 per cent of copper and is known as pure copper carbonate. The other type contains about 18 per cent of copper and is known as the "diluted" or "extended" form. Where soil infestation is abundant in the Northwest, the latter, according to some reports, has not proved as effective in the control of bunt in wheat as the pure copper carbonate. In the regions where no soil infestation occurs both types have proved satisfactory.

Amount of copper carbonate to use. Two ounces of copper carbonate per bushel of wheat or sorghum is sufficient under most conditions if properly applied. As much as three ounces has been recommended at times where seed or soil infestation, or both, is very heavy. This is especially true where the "diluted" type of carbonate is used. If conditions are such that more than the usual application seems to be necessary, no harm will be done if three ounces or even more is used, as it is not likely to injure the seed. If it becomes necessary to sow seed black with smut, it is advisable to treat with formaldehyde or copper-sulphate instead of copper carbonate. It is seldom necessary to sow seed black with smut however.

Application. Copper carbonate, to be effective, must completely cover the seed. The lack of satisfactory results in many cases no doubt has been due to lack of thorough application. Machines of the rotary type are best for applying the dust. The grain and carbonate should be mixed by rotating the machine until each kernel is thoroughly covered with a thin film of the dust. The speed of the machine and the amount of grain contained, as compared with its capacity, will determine the amount of time necessary to rotate. One to 2 minutes should be sufficient ordinarily. We no longer recommend the mixing of copper carbonate with grain by shoveling over on the floor. So much dust gets into the air that it causes considerable irritation and even nausea when inhaled. Wear a dust mask or wet handkerchief over the nose and mouth while the grain is being treated.

There are several commercial makes of mixing machines which are satisfactory for treating seed with copper carbonate. A tight barrel of convenient size may be used for making a mixer on the farm. Ordinary gas, or other iron pipe with standard fittings may be used for the axle and crank. Bore a hole in the center of each head of the barrel large enough

so that a 1-1/2 inch pipe will fit tightly. Thread the pipe far enough down at each end so that an iron disc may be screwed against the head of the barrel. Cut a convenient sized (12 inches) square opening in the side of the barrel, making the cut slanting toward the center. This piece can then be reinforced with straps of iron or pieces of wood and hinged in place to make a door into the barrel. The door can be fastened by hook and clasp or a revolving wooden latch. A crank is fastened to one end of the axle and the barrel is then mounted on a substantial rack similar to the mounting of emery stones used for sharpening tools. The machine is then ready for use. The barrel should not be filled over one-half full of seed and for best results not over one-third full. The fuller the barrel, the less agitation or mixing there will be when it is revolved.

Advantages of the copper carbonate treatment. (1) It does not injure germination. In fact, treated seed often germinate better than untreated seed. (2) Seed can be treated whenever convenient and stored without injury. (3) Dusted seed can be sown at any time in dry or moist soil. (4) It is cheap and easy to apply. (5) Copper carbonate protects stored grain from attacks by weevils. Rats and mice will not eat it if there is untreated grain in the storehouse on which they can feed. Do not treat and store grain that is to be used for feed or milling purposes.

Warning. (1) Copper carbonate is not satisfactory for the control of the smuts of oats and barley and the loose smut of wheat. (2) Protect your nose and throat by wearing a dust mask while treating seed with copper carbonate. (3) Avoid using heavily smutted seed as much as possible even when treating. (4) Do not market wheat except for seed after treating with copper carbonate. (5) Seed treated with copper carbonate should not be allowed to become wet or stand in the seeding machine under moist conditions. Excess carbonate should be carefully and regularly cleaned from the machine. Caking of the dust may injure the seeder. It is sometimes desirable to rock the wheels of the machine back and forth before starting it to loosen the grain.

- - - - - - - - - - -

PLANS FOR PROPOSED SUPPLEMENTAL EXTENSION WORK IN SMUT CONTROL TO BE CARRIED OUT BY THE U. S. DEPARTMENT OF AGRICULTURE IN COOPERATION WITH OTHER AGENCIES

By F. C. Meier, Extension Plant Pathologist, Washington, D. C.

SUPPLEMENTAL SMUT CONTROL WORK PLANNED BY THE DEPARTMENT OF AGRICULTURE

Recognizing the fact that extension leaders in most wheat States understand the need for urging treatment of seed wheat and in most instances are already energetically conducting work, not only with their own forces, but also in cooperation with the business organizations concerned, it is the purpose of the Department during 1926 to further the work by (1) making available additional literature, posters, lantern slides and other material suitable for publicity and educational work; (2) assisting in the coordination of Federal, State and business interests in a campaign to reduce losses due to stinking smut.

It is not intended that the work will result merely in extreme acitivity in the fall of 1926. Instead it is hoped that a program of education will be mapped out that will run over several years, as long as is necessary to secure maximum treatment.

Within the Department of Agriculture leadership of this extension program in smut control will be centered in the office of the extension pathologist who is cooperating with the Office of Cereal Crops and Diseases.

THE NEED FOR INCREASED EFFORTS TOWARDS CONTROLLING STINKING SMUT

Stinking Smut Causes Severe Losses

This disease of wheat, known to farmers in some sections as bunt or "bust", has caused severe losses in wheat-growing regions during recent years. The damage caused by stinking smut is four-fold:

(1) Wheat which is attacked in the field is actually destroyed, and the yields are reduced in proportion to the amount of smut present.

(2) An excessive amount of bunt in threshed wheat destroys its usefulness for certain purposes until the smut is removed from the wheat through washing or scouring, and this is directly reflected in a reduction in price paid for the smutty wheat at the elevator, grain exchange or mill.

(3) Smutty wheat requires special treatment before being milled into flour, thus the cost of milling is increased.

(4) Separator explosions at threshing time, due to the ignition of clouds of smut dust in the separator, may result in heavy property damage. According to G. L. Zundel, Extension Pathologist, Washington, about 400 separator fires occurred in eastern Washington and northern Idaho during the 1923 harvest season.

Field Losses

During the past few years stinking smut has become more and more a cause of loss. Estimates of the reduction of yield caused by stinking smut in wheat during the years 1917 to 1924 indicate that losses in the United States run from 5,000,000 to 26,000,000 bushels a year. The average estimated reduction in yield during this period was over 14,000,000 bushels annually. The highest loss was in 1924 when over 26,000,000 bushels of wheat were destroyed in the field by stinking smut. The prevalence of stinking smut in 1924 no doubt accounts in large measure for its spread in 1925 when it caused heavy losses.

Smut Dockage at the Grain Market

The fact that smut has been increasing in importance is borne out not only by field observations on reduction of yield, but also by grain inspection records. The following summarized reports of the Federal Grain Supervision Service from several of the leading markets are of interest in this connection. 1/

Portland, Oregon: Study of inspections made at Portland and Astoria, Oregon, shows that smut has increased both in spring and winter wheat in the territory shipping wheat which is inspected at those markets. In the year 1920-21 out of over 7,500,000 bushels of wheat received at Portland and Astoria, smut dockage was assessed on 26 per cent, and for the year 1924-25 the disease had increased to a point where out of more than 12,700,000 bushels received, 61.5 per cent were docked on account of the presence of smut. (This increase in part due to necessity of replacing winter wheat which had been killed with spring wheat, lack of time preventing treatment).

Omaha, Nebraska: In speaking of the condition of shipments received at Omaha, Nebraska, Mr. E. L. Morris, Division Supervisor, Federal Grain Supervision, makes the following statement:

> "Our records show that during 1924 Omaha wheat receipts grading smutty approximated 26 per cent, while during the past season of 1925 they approximated 44 per cent."

1/ Studies are now being made of reports on inspections at more than 100 grain markets in an effort to obtain rather complete information with regard to losses caused by smut. A detailed report will be made on this work by Mr. E. G. Boerner at a later date.

Kansas City, Missouri: At Kansas City for 1924 according to Mr. Morris, receipts graded 15 per cent smutty, and for 1925, 23 per cent.

Ogden, Utah: From Ogden, Utah, Mr. J. F. Welch, Grain Supervisor, Federal Grain Supervision, reports that smut has increased to such an extent that while in 1922 only 12 1/2 per cent of receipts graded smutty, in 1925 the county came to 45 per cent.

Eastern States: In Delaware, Maryland and Virginia grain dealers and millers report a decided increase in the amount of stinking smut in grain harvested in 1925. During the last two years it has not been uncommon for farmers in this region to be docked as much as 15 cents per bushel on account of the high smut count.

Smut Treatment at the Mill

The following extract from a report made by J. H. Shollenberger, Grain Supervisor, Milling and Baking Investigations, Grain Division, Bureau of Agricultural Economics, gives some idea of methods of handling smutty wheat at the mill.

> "The presence of smut in wheat requires extra treatment and handling to put it in proper condition for milling. If the smut is present in small amount (1/2 per cent smut dockage) in the form of soft smut balls, a slightly stronger suction on the receiving and milling separators will ordinarily remove them from the wheat, but in so doing the amount of broken and small wheat kernels removed will be increased. The material thus removed has approximately the same value as bran and shorts. If the smut is present in small amount (1/2 per cent smut dockage) in the form of hard balls, it requires, in addition to the extra treatment required for soft balls, extra scouring or washing for their removal. The washing softens the hard balls so the scourers can more readily pulverize and remove them. If wheat is distinctly discolored with smut, or if it contains smut balls in excess of 1/2 per cent smut dockage, washing or liming and extra scouring is necessary to properly condition the wheat for milling. This treatment is expensive, and the material thus removed is of little or no value.
>
> "The material removed by the washer is a complete loss. That removed by the separator and scourers, if not too smutty, is sometimes sold to sheep raisers at from $5.00 to $10.00 per ton, but if very smutty is worthless and is burned or otherwise destroyed."

In speaking of discounts on wheat sold to mills, Mr. R. C. Miller, Grain Supervisor, Minneapolis, makes the following statement:

"According to the best information which has come to my attention at different times, the discounts for reasonably smutty Hard Red Spring wheat range from about 5 cents to 8 cents per bushel, and in the Durum wheat, especially when purchased at flour mills, the discount ranges from about 10 cents to 20 cents per bushel. Naturally, certain cars of wheat not especially badly smeared with smut would be purchased at a lesser discount, while in other cases, very smutty wheat was more severely discounted, even up to 25 cents and 30 cents per bushel.

"The discount for high quality Amber Durum wheat which has been in great demand among the flour mills for the purpose of making Semolina where smut is very noticeable, has been very abnormal since smut is very detrimental from the standpoint of the manufacturers of macaroni."

Losses can be Prevented by Seed Treatment

The copper sulphate-lime and formaldehyde seed treatments for the control of stinking smut have been applied for many years. In the west farmers in certain sections have made a regular practice of disinfecting their seed wheat. Copper carbonate dust recently has come into use as a disinfectant, and has become popular among farmers for the control of bunt. In the State of Washington, for example, where the work started with 10 one-acre demonstrations in 1921, the copper-carbonate treatment was found so satisfactory that by 1924 over 1,500,000 acres were sown with wheat treated by this method.

DISTRIBUTION OF THE WORK

Bunt is a serious problem in both winter and spring wheat areas. During the summer and fall of 1926, a vigorous seed treatment campaign could be advantageously conducted in the winter wheat States. In the spring wheat areas the work started this year will be continued. The wheat States, with acreage sown for the 1924 crop and farm value based on the December 1 price are as follows:

STATE	WINTER WHEAT	
	Acreage sown in preceding fall 1,000 acres	Total farm value December 1 1,000 dollars
New York	380	9,487
New Jersey	77	2,149
Pennsylvania	1,240	28,584
Delaware	106	2,327
Maryland	562	12,371
Virginia	775	14,249
West Virginia	212	3,784
North Carolina	486	8,870
South Carolina	129	2,509
Georgia	140	1,436
Ohio	2,468	54,104
Indiana	1,963	44,538
Illinois	2,678	46,581
Michigan	922	27,445
Wisconsin	66	1,802
Minnesota	105	2,860
Iowa	408	10,259
Missouri	2,134	32,703
South Dakota	89	1,400
Nebraska	2,941	66,469
Kansas	9,819	196,664
Kentucky	620	6,206
Tennessee	395	5,248
Alabama	11	130
Mississippi	4	48
Texas	1,469	33,316
Oklahoma	3,485	68,044
Arkansas	62	902
Montana	685	13,507
Wyoming	16	284
Colorado	1,268	18,349
New Mexico	122	2,062
Arizona	32	1,180
Utah	157	2,324
Nevada	3	99
Idaho	397	7,399
Washington	1,687	25,160
Oregon	945	16,815
California	691	7,346
UNITED STATES -	33,749	779,510

STATE	SPRING WHEAT	
	Acreage 1,000 acres	Total farm value, December 1, 1,000 dollars
Maine	5	221
Vermont	3	90
New York	14	363
Pennsylvania	10	245
Indiana	4	102
Illinois	81	2,050
Michigan	7	174
Wisconsin	45	1,210
Minnesota	1,574	44,607
Iowa	32	698
Missouri	3	53
North Dakota	8,685	169,619
South Dakota	2,216	41,272
Nebraska	195	3,211
Kansas	9	120
Montana	2,517	50,561
Wyoming	125	2,081
Colorado	316	5,966
New Mexico	53	1,126
Utah	105	3,412
Nevada	16	504
Idaho	580	15,956
Washington	946	10,330
Oregon	230	3,115
UNITED STATES	17,771	357,086

AGENCIES INTERESTED IN SMUT CONTROL

As previously stated many of the wheat States have for one or more years successfully conducted extension programs on this project. The object of those working in the Department will be to stimulate a national program for smut control, a program which will enlist the support of State and Federal agencies as well as that of the financially interested commercial organizations.

Among the agencies which might advantageously take part in this work are the following:

1. State Extension and Experiment Station Organizations

2. U. S. Department of Agriculture

A. Bureau of Plant Industry

(1) Office of Cereal Crops and Diseases
(2) Plant Disease Survey

B. Bureau of Agricultural Economics

(1) Grain Investigations
(2) Federal Grain Supervision

C. Office of Cooperative Extension Work

3. Wheat Improvement Associations

4. Commercial Organizations, such as:

A. Mill Owners Associations
B. Association of Operative Millers
C. Grain Exchanges
D. Cooperative Grain Dealers
E. Railways which transport grain and maintain elevators
F. Civic and Commercial Agencies
G. Chambers of Commerce
H. Boards of Trade
I. Agricultural Implement Manufacturers
J. Bankers Associations
K. Motion Picture Distributors Associations

5. Companies manufacturing copper carbonate and those manufacturing treating machinery

6. Wholesale Drug Companies

7. Local Dealers

A. Druggists
B. Hardware Merchants
C. Implement Dealers

8. Radio Stations

9. Publications

A. Farm and City Press
B. Trade Journals such as

(1) Elevator and Grain Trade
(2) National Miller

(3) Northwest Miller
(4) American Miller
(5) Southwest Miller
(6) Dixie Miller
(7) Inland Miller

C. Journal of Cereal Chemistry

LITERATURE AND OTHER MATERIAL WHICH CAN ADVANTAGEOUSLY BE USED

Some of the following material is now being prepared by the Department of Agriculture. Much, of course, is already in existence in the form of State publications.

1. Poster

2. Four-page folder for use as correspondence enclosure

3. Circular for use in (1) Boys' and Girls' Club Work (2) Rural Schools (3) Vocational Schools

4. Department Circular

5. Brief summarizing County Agents' reports on smut control work for 1925

6. Mimeographed suggested plan of work for use by county agents

7. Newspaper stories

8. Slogans

9. Radio talks (Mimeographed form for use by individual stations)

10. Lantern slide lecture with syllabus

11. Film copies of the above lecture

12. Propaganda slide for use during intermissions in motion picture houses operating in wheat counties

13. Exhibit at Philadelphia Sesquicentennial Exposition

14. Many other types of publicity material will doubtless occur to those locally in charge of the work. The opportunities are good for school contests; use of various types of circulars, mailing cards, etc.

PROCEDURE

In order to decide whether smut control work should be a major project in a county, it is of course desirable to have statistics on losses. Plant Disease Survey records for the State should help in this connection. Statistics as to the amount of smutty wheat arriving at any of the terminal markets and graded under the provisions of the U. S. Grain Standards Act can be obtained from the Office of Federal Grain Supervision at those markets, or from the Grain Division of the Bureau of Agricultural Economics, Washington, D. C.

Where such a step has not already been taken, one of the first things which might be done in making a start on a campaign for treatment of seed to be planted in the fall of 1926 is that of arranging for a conference at the Central Grain Market for adjacent States. At these meetings an effort should be made to have representatives present from most of the groups named on pages 22, 23 and 24. Such meetings can advantageously be arranged by the Extension Director after conferences with representatives of the business interests at the Market.

At such meetings the following subjects can be discussed:

1. Stinking smut, its relation to wheat, and methods of control

2. Plans to control smut, involving the use of such means and agencies as those listed on pages 22, 23 and 24

3. Financial aid

In case meetings of this sort are held, it is hoped that the Federal Extension Pathologist, or his representative, can be present in order to participate in making plans for the work in order that arrangements can be made for preparation of such illustrative and other material as may advantageously be made available by the Department for use in the campaign.

Before or following these meetings, if the State Specialist has not already done so, arrangements should be made to assist county agents in the development of a program of work in which the various steps to be taken during June, July, August, September and October will be mapped out in advance.

Once a program has been decided on, plans should be brought to the attention of retail dealers, also to representatives of companies which manufacture copper carbonate and treating machines. This is, of course, important in order to insure a supply of materials.

- - - - - - - - - - - - - - -

CAMPAIGN FOR PREVENTION OF GRAIN SMUTS CONDUCTED BY THE NORTHWEST GRAIN SMUT PREVENTION COMMITTEE

By Robert H. Black, Marketing Specialist,
Grain Investigations, U. S. Department
of Agriculture

The Northwest Grain Smut Prevention Committee was organized January 6, 1926 by agricultural colleges, grain interests and others desirous of preventing another smutty crop of wheat such as occurred in the northwest in 1925. The amount of smutty wheat received at Minnesota terminals had been gradually decreasing during the past 7 years until 1923. In 1924 a slightly larger amount of smutty wheat was received, but in 1925 the amount of smutty wheat was much greater than for the entire 5 years previous. During the first 3 months of the marketing of the 1925 crop, Minnesota terminals received over 16,000,000 bushels of smutty wheat, which was over one-fourth of the total wheat receipts.

MEMBERS

The Northwest Grain Smut Prevention Committee consisted of the agricultural institutions, the grain interests, the railroads in the affected area, Minneapolis Civic & Commerce Association, Minnesota Farm Bureau Federation, the Northwest Farm Press and the U. S. Department of Agriculture.

INDIVIDUAL ACTIVITIES

The Minnesota agricultural college was represented by Dr. E. C. Stakman, plant pathologist and R. C. Rose, extension pathologist. A bulletin was prepared and released by Dr. Stakman and Mr. Rodenheiser, and several news releases were issued by the agricultural college newspaper service to county newspapers. Dr. Stakman spoke at several conventions and delivered a radio address over WCCO. Mr. Rose assisted county agents in organizing their counties and helped them hold meetings and demonstrations during the campaign.

Montana was represented by A. J. Ogaard, extension agronomist. Mr. Ogaard and Mr. Morris prepared a bulletin, and assisted in holding many demonstrations throughout the smut infected areas of Montana. A large number of local stories and press releases were sent out by the University of Montana.

North Dakota was represented by Dr. H. L. Walster, Dean of Agriculture, N. D. Gorman, county agent leader, and Professor H. L. Bolley, plant pathologist. Bulletins were issued by the North Dakota Agricultural College especially for this campaign, together with a large number of press releases prepared to meet the needs of country papers in North Dakota. The county agents held demonstrations and distributed literature prepared by the Committee.

South Dakota was represented by Dr. A. N. Hume, agronomist, and Ralph E. Johnston, extension agronomist. Mr. Johnston spoke at several meetings and assisted the county agents in organizing their work. Newspaper releases were prepared by the College Publicity Department and sent to the country papers. County agents distributed the posters and folders prepared by the Committee.

The Northwest Farm Press, including such farm papers as the Farmstead, Stock and Home, The Farmer (St. Paul), the Dakota Farmer, North Dakota Wheat Grower, Co-operative Manager and Farmer, ran nearly all of the press releases sent out by the Committee and special feature articles which they secured from their own subscribers, and each one devoted one special issue to the smut campaign.

The U. S. Department of Agriculture was represented by Robert H. Black, Marketing specialist. The Bureau of Plant Industry and Extension Service furnished 100 sets of 6 lantern slides. Several press stories and a special radio talk were distributed from Washington. Fifty-three thousand franked envelopes and 30,000 franked slips were furnished for distributing publicity material. Mr. Black prepared a map showing the infected areas, furnished several press releases, and gave radio talks.

The Minneapolis Civic & Commerce Association furnished the service of Mr. C. W. Shirk, who acted as secretary of the Committee, and C. M. Arthur, who prepared newspaper publicity. The Association also furnished the office space for the Committee and the Wholesalers and Jobbers Section donated $200.00 to the campaign fund.

The Minnesota Farm Bureau Federation published articles prepared by the Committee in their official publication, the Farm Bureau News.

Members of the Minneapolis Chamber of Commerce contributed a large share of the campaign fund. R. P. Woodworth, Chairman of the Committee devoted much of his time during the 3 months to organizing and directing the campaign. D. D. Tenney, G. F. Ewe, B. F. Benson, W. H. Gooch, F. M. Crosby and E. E. Mitchell served on the executive committee. Each of the towns in the infected area were allocated to the travelling representatives of the line houses and commission merchants, and these men reported the progress of the campaign in these towns. There were also responsible for seeing that the campaign was progressing properly in each town, that the posters had been placed and that the elevator operators were all supplied with chemicals and machines. Several of the grain men purchased treating machines and loaned them to the farmers. Many of the non-county-agent counties were organized completely by the grain men. Letters were sent to all grain buyers.

The Duluth Board of Trade furnished statistics, distributed publicity material and contributed to the fund. Part of the contributions credited to Minneapolis should also be credited to Duluth because the same companies maintain offices in both markets.

The Equity Co-operative Exchange prepared and distributed a bulletin of their own and also distributed the publicity material prepared by the Committee. Several treating machines were purchased and loaned to the farmers for treating wheat with copper carbonate. The Equity Co-operative Exchange also contributed to the fund. C. U. Somers served on the executive committee.

The Great Northern Railway Company was represented by E. C. Leedy; The Northern Pacific by John Haw; The Soo Line by Harry S. Funston; the Minneapolis & St. Louis by C. C. Lake; the Chicago & Northwestern and Chicago, Minneapolis & Omaha by E. A. Donnelly; and the Chicago, Milwaukee & St. Paul by J. H. Foster. The railroads contributed $1,000 to the fund and distributed the posters for each town to their local agents. The agricultural agents organized many of the non-county-agent counties, and furnished mailing lists for these counties. The Minneapolis & St. Louis issued a special circular showing smut losses at every local station. The agricultural agents of the railroads and their assistants arranged for many demonstrations and gave talks on smut prevention.

PUBLICITY

Thirty-five thousand copies of the poster were printed and distributed as follows:

Organization	Miscl.	Minn.	Mont.	N. Dak.	S. Dak.	Total
Banks		296	49	262	165	772
Commercial Clubs		381	139	195	176	891
County agents	74	3,337	2,322	2,322	2,323	10,378
Druggists	30	148	5	7	3	195
Elevators & Grain Dlrs.	106	1,004	51	241	104	1,506
Direct to farmers	195	275	250	200	180	1,100
Hardware & Imp. Dlrs.	25	26	202	15	20	288
Newspapers	8	583	192	258	332	1,373
Railroads	573	6,496	2,538	5,201	1,876	16,684
Schools	53	101	248	67	99	568
Wholesalers	128	5				133
Miscellaneous	88	21	52	18	40	219
Totals	1,280	12,673	6,048	8,786	5,318	34,105

Four-hundred-fifty thousand copies of the folder were printed and distributed as follows:

Organization	Minn.	Mont.	N.Dak.	S.Dak.	Miscl.	Total
Banks	18,900	4,515	15,280	9,100	1,000	48,795
Commercial Clubs	5,030	400	2,029	415	702	8,576
County agents	18,475	25,320	59,445	38,101	1,900	143,241
Druggists	20,050	1,050	2,150	1,150	325	24,725
Elevators & Grain Dlrs.	25,350	8,026	34,280	18,719	2,940	91,315
Direct to Farmers	11,185	8,200	20,000	11,300	7,150	57,835
Hardware & Imp. Dlrs.	2,328	1,055	2,100	1,800	1,600	8,883
Newspapers	583	192	258	332	127	1,492
Railroads	1,840	1,267	2,390	1,139	3,157	9,813
Schools	1,842	3,590	358	670	1,114	7,574
Wholesalers	3,201	3,001	500	700	128	7,530
Miscellaneous	6,558	5,231	10,271	7,373	10,538	39,971
Totals	115,342	61,867	149,061	90,799	32,861	449,750

Nine press releases and one suggested advertisement were sent to county newspapers and were used with the following results:

	No. of papers	Total Columns	Total Articles
January, 1926			
Minnesota	59	45 1/4	69
North Dakota	25	24	33
Montana	23	15 1/4	23
South Dakota	20	13 1/4	22
Totals	127	97-3/4	147
February, 1926			
Minnesota	268	268 1/2	541
North Dakota	133	201 1/2	332
Montana	76	118 1/4	200
South Dakota	133	192 1/2	330
Totals	610	780-3/4	1,403
March, 1926			
Minnesota	353	294 1/4	474
North Dakota	209	354 1/4	477
Montana	53	40 1/4	94
South Dakota	130	132-3/4	269
Totals	745	821 1/2	1,314

	No. of papers	Total Columns	Total Articles
Recapitulation			
January-March, 1926			
Minnesota	600	608	1,084
North Dakota	367	579 3/4	842
Montana	152	173 3/4	317
South Dakota	283	338 1/2	621
Totals	1,482	1,700	2,864

Many of the country newspapers also ran editorials and local stories regarding the smut conditions and demonstrations in their own localities.

Many special articles were prepared for the daily newspapers, grain trade papers, drug trade papers and country newspapers.

Radio talks were given from stations WAMB, WCCO, KFMX, WPAK, KFJM, KFDY, KWSD, KNOM and CNR.

A lantern slide prepared by the committee was sent to each of 512 members of the Motion Picture Theatre Owner's Association of the northwest. Their president wrote to each member urging them to do everything in their power to assist in the campaign in addition to using the lantern slide at each show.

One hundred sets of 6 slides each furnished by the Extension Service of the U. S. Department of Agriculture were distributed as follows: 16 to county agents in North Dakota, 25 to county agents in South Dakota, 25 to county agents in Minnesota and 23 to county agents in Montana. Eleven sets were furnished the railraods for use in non-county-agent counties. In addition to the use of these slides at meetings and by county agents and other county organizers, 29 theatres in Minnesota, 47 in North Dakota, 51 in South Dakota and 35 in Montana used 3 sets of slides during the entire campaign.

The Governors of North Dakota and Montana issued proclamations setting aside the week of February 21 to 27 as Smut Prevention Week.

Many individual, personal letters were sent to dealers and farmers in the country by those members of the Committee who were in the best position to influence the farmers to treat their wheat for smut before seeding.

Letters were sent out by the Northwest Grain Smut Prevention Committee asking the cooperation of the different groups.

The agricultural agents of the railroads sent letters to all of their agents, and the Minneapolis & St. Louis issued a special letter showing the smut losses at each station.

Many of the manufacturers and jobbers sent letters during the campaign to their customers.

The U. S. Department of Agriculture sent 4,000 letters to grain dealers and 53,000 letters to farmers. (Franked envelopes were furnished by the Department and the expense of printing and mailing these letters was borne by the committee.)

The Grain Bulletin sent letters and suggested letters to all of the grain trade and county agents.

The following bulletins were issued or reissued during the campaign:

"Treatment for Seed Grain" by E. C. Stakman, R. C. Rose and H. A. Rodenhiser, Minnesota

"Control of Smuts on Cereal Crops" by H. L. Bolley, North Dakota

"Loose Smut of Wheat" by W. E. Brentzel, Plant Pathologist, North Dakota

"Copper Carbonate Treatment for Stinking Smut of Wheat" by U. S. Department of Agriculture

"Single Bath Hot Water & Steam Treatments for Control of Loose Smut" by V. F. Tapke, U. S. Department Bulletin 1383

"Dusting for Smut" by H. E. Morris and A. J. Ogaard, Montana

Fifty dollars in prizes has been offered for the best window display made by retail stores. Awards will be made from photographs submitted before May 1.

The real results of the campaign will not be known until the grain crop begins to move in September, but the present indications are that much of the stinking smut will be controlled this year.

The farm press and country newspapers carried more lines of reading matter to the farmers on the prevention of smut than on any other subject. Nearly all of the educational and mercantile interests assisted in presenting the necessity of smut treatment direct to farmers.

Reports received last week from county agents and other sources indicate that over 70 per cent of the farmers will treat their seed for smut.

The manufacturers of copper carbonate report that sales were 300 per cent greater up to April 10 than expected. On the same date the manufacturers of formaldehyde were 5 days behind on deliveries although they had anticipated a demand this year several times greater than in 1925.

It is the plan of the committee to continue the campaign through the coming year.

- - - - - - - - - - - - -

BUNT OF WHEAT FROM THE PLANT DISEASE SURVEY STANDPOINT

By R. J. Haskell, Pathologist
Plant Disease Survey, U. S.
Department of Agriculture

The prevalence of bunt in wheat last year undoubtedly resulted in a high percentage of infected seed being planted both last fall and this spring. We may naturally expect, therefore, an abundance of the disease this year in fields sown with untreated seed. Cool weather at the time of germination is favorable to bunt. A glance at the weather reports for September and October, 1925 shows that October was a very cool month which would favor burt infection of wheat that was germinating at that time. On the other hand September was generally warm in the east and so wheat which was in the susceptible stage during September might not have been infected so heavily. September was wet, however, in some of the north central States centering about Illinois so that wheat seeding there was delayed until October.

Because of the probable prevalence of bunt this year and the need for encouraging treatment of the seed with copper carbonate it is especially desirable that we have as many and as accurate estimates as possible of the amount of bunt in 1926. It is, therefore, hoped that all extension pathologists, county agents, and others who read the Extension Pathologist will take advantage of every opportunity possible to make estimates of the reduction in yield because of bunt, as well as the amount of dockage occasioned by it, and will report them to the Plant Disease Survey or to some of its collaborators. We should know just where the disease is worst and how much damage it is causing in the various sections. With these facts at hand control campaigns can be organized most efficiently.

In estimating percentages of bunt, counts of 100 heads should be made in several representative parts of the field and the number of infected heads recorded. The number of counts will depend on the size and topography of the field, but a sufficient number should be made to be representative of the entire acreage. The usual method employed is to count 100 consecutive heads along a drill row. This is more convenient and simpler than some other methods and requires no special equipment. The average of all counts gives the average for the field.

Probably the best time to get an estimate of the percentage of bunt in a given lot of wheat is at the threshing machine when samples of the chaff as well as the grain can be examined. It would be very desirable to have a large number of reports based on examinations of grain either at the threshing machine or later.

A few words might be said concerning the situation last year. A summary of reports of collaborators and correspondents of the Plant Disease Survey shows that in 1925 bunt was unusually prevalent in certain parts of the country, especially in the Middle Atlantic States and in parts of Kansas and Colorado. Undoubtedly other large areas of heavy infestation occurred concerning which we have no report. In the past bunt has not been considered of great importance in the eastern United States, but last year it was serious in States along the Atlantic Coast from New York to North Carolina. In Pennsylvania it was more severe than in any other year for which records have been kept, and in Virginia collaborators reported the highest infection in the history of their 10 years' experience.

The outbreak in the eastern United States may be correlated with low soil temperatures during the period of wheat germination in the fall of 1924 when exceptionally cool weather prevailed during the latter part of September and early October.

- - - - - - - - - - - - - -

News notes, extension articles, or suggestions with regard to subjects that might be discussed profitably in this news sheet should be addressed to:

Fred C. Meier,
Extension Plant Pathologist,
Bureau of Plant Industry and Office
of Cooperative Extension Work,
U. S. Department of Agriculture,
Washington, D. C.

THE EXTENSION PATHOLOGIST
SUPPLEMENT IV
Index

Volume IV, Numbers 1 and 2
March and May, 1926.